

Antarctica: Colonization Ends Era of Exploration, Emphasis Shifts To Organized Polar Science Program

The United States is dug in deeply in Antarctica, and there is every prospect that the nation will be kept committed there for the foreseeable future by a combination of scientific and political considerations. An earlier pattern of periodic assaults on Antarctica by expeditions which stayed a year or two and then decamped has been supplanted by one of occupation, with stations manned the year around and a continuing scientific program.

The new era in Antarctica began with the International Geophysical Year of 1957-58, when, as part of the worldwide study of man's physical environment, the United States and 11 other nations carried out an extensive cooperative scientific program in Antarctica, and in doing so made heavy investments in bases and equipment. Most of the participating governments concluded that to abandon Antarctica at the end of the IGY would be both wasteful and imprudent.

Gone, to a great degree, therefore, are the ways of Scott and Amundsen, even of Ellsworth and Byrd, of dashes to the pole, of derring-do and improvisation. Dangers and hardships remain, but the characteristic figure in Antarctica is no longer the polar explorer behind his dog team but the scientist and technician.

American operations in Antarctica have become a matter of annual appropriations in Congress, long-range planning, and interagency cooperation. For scientists, the government's interest in Antarctica opens new horizons for research and new opportunities for federal research grants.

United States activities in the Antarctic have been continued on the general lines laid down during the IGY. The Navy provides logistical support and people to maintain installations, while the scientific personnel run their projects themselves. Civilians are responsible to "scientific leaders" at each base, and only in emergencies are they subject to military authority. Though this arrangement has not worked without friction, particularly during the long winter months when small parties live confined, the division of authority and responsibility has worked well enough to satisfy both groups.

Control and coordination of the United States scientific program in the

Antarctic is centered in the National Science Foundation. The NSF's Office of Antarctic Programs, headed by Thomas O. Jones, is responsible for science funding and planning, and the office works with the Defense Department's Antarctic Projects Office on logistical planning to insure that the scientists will get where they want to go with the equipment and supplies they need. The NSF office performs a wide range of tasks, from awarding grants to universities for antarctic research projects to staffing and charting the voyages of its ocean-going research station, the U.S.N.S. *Eltanin*, which is operated for NSF by the Military Sea Transport Service.

The National Academy of Sciences is interested in the antarctic effort but has played an advisory rather than an operational role. The Academy's committee on polar research, made up of a cross section of experienced polar scientists, in 1960 and 1961 produced a report aimed at setting long-term goals for scientific research, and which included suggestions for projects to accomplish these goals. The Academy committee also represents the United States in the Scientific Committee for Antarctic Research (SCAR)—the committee set up to oversee international scientific cooperation in Antarctica. In practice, say observers, most things done in the way of cooperation in Antarctica have been handled through bilateral agreements between nations which signed the Antarctic Treaty.

Of the 12 nations which participated in IGY activities in Antarctica and signed the treaty, three—Belgium, Japan, and Norway—do not currently operate programs there. Active in Antarctica now, in addition to the United States, are Argentina, Australia, Britain, Chile, France, New Zealand, the Soviet Union, and South Africa.

The United States itself maintains four bases including the main supply station, McMurdo, and the South Pole station, where the winter temperature reaches -100°F . The United States and New Zealand jointly operate Hallett Station on the Cape Adair coast.

The Soviets list four year-round stations, all in the Eastern half of the continent.

In terms of men and material the United States program is the biggest in Antarctica, and an arrangement with New Zealand enabling us to use dock and airport facilities at Christchurch

(Continued on page 700)

Readers' Comments

Congress and Research

I have read with interest your editorial, "Congress and Research," in the 25 January issue of *Science*. While fully agreeing with your thought that Congress is moving in the direction of giving closer scrutiny to the management of the large and rapidly increasing federal funds for scientific research, I cannot accept your thesis that this is undesirable.

I find especially open to question your assumption that what you call the "increasingly liberal" policies pursued by the National Institutes of Health in the past are more beneficial to scientific accomplishment than the more fiscally responsible policies urged by our Committee.

When you state: "It has been alleged that the agency is not exercising sufficient control over the expenditure of government funds," you imply that this finding has not been well documented and established. I am taking the liberty of sending you under separate cover the reports issued by our Committee concerning the administration of the NIH grant programs (House Report No. 321 and House Report No. 1958 of the 87th Congress), together with the related Subcommittee hearings. These, I believe, amply demonstrated the need for clear and objective government policies for assuring the most prudent expenditure of public funds as well as the equitable treatment of scientific investigators.

In this same connection I would refer you to the excellent article, also appearing in the 25 January issue of *Science*, which analyzes irregularities in the handling of National Science Foundation funds by the American Institute of Biological Sciences. These irregularities appear to have resulted from the kind of "liberal" policies advocated in your editorial.

L. H. FOUNTAIN

Representative Fountain, Democrat from North Carolina, is chairman of the Intergovernmental Relations Subcommittee of the House Committee on Government Operations. The subcommittee has been extremely critical of the fiscal practices of the National Institutes of Health, and has been the principal source of pressures that have resulted in NIH adopting tighter administrative policies.

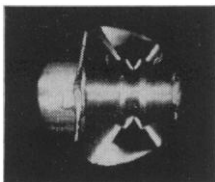
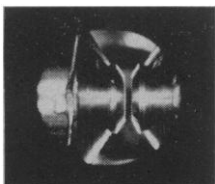
SPACE VACUUM DEVELOPMENTS

Studies at National Research show metals may weld together in space.

It now develops that certain proposed lunar and interplanetary operations may be quite impossible with present materials and equipment designs. Ultra-high vacuum phenomena, studied at National Research Corporation's Space Vacuum Laboratory, indicates that moving metal parts could actually "cold weld" together in the vacuum of outer space environments.

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NEWS AND COMMENT

(Continued from page 578)

provides an advantageous jumping-off place for Antarctica.

All active American bases can be supplied by air, and the introduction of the big C-130 "Hercules" cargo plane fitted with skis for landing on snow means that heavier cargoes can be moved to more remote areas during a longer period in the open summer months.

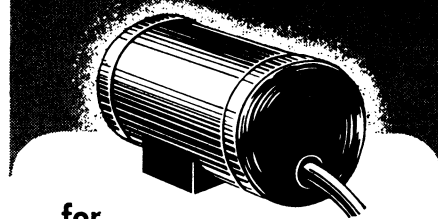
The United States, for example, can fly in supplies to its Pole station, located at an elevation of over 9000 feet near the center of the continent. On the other hand, the Russian Vostok station, hundreds of miles from the coast and at an altitude of 14,000 feet on the great ice plateau which covers most of the eastern part of the continent, is supplied only by tractor train. Since the tractors must start for Vostok at the beginning of the summer season, supplies must be moved into the Russian coastal station nearly a year in advance.

In speed and convenience, therefore, the United States enjoys a logistical edge over other nations in Antarctica. The antarctic airlift is an impressive achievement, though it has been suggested that the service is sometimes put to nonessential use to transport VIP tourists and equipment which could be moved less expensively by other means.

The antarctic summer extends from October to March; quite soon the 1962-63 summer season will end, and the human population in Antarctica will take its seasonal drop. The number of American scientists there will fall from about 170 to fewer than 50, and the number of servicemen, which during the summer may hit 2000, when crews of ships and planes and construction details are on hand, will fall to perhaps a fifth of that number.

The exodus at the end of the summer is in part a result of the change in the character of the antarctic scientific program. Albert P. Crary, chief scientist for the NSF antarctic program, says that post-IGY operations reflect two major influences: (i) broadening of the scientific program beyond the synoptic sciences which were emphasized in the IGY (the synoptic sciences are those which require observation over a large area of the world simultaneously, such as meteorology and upper-atmosphere physics); (ii) the descent on Antarctica of the individual investigator with uni-

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versity or other nongovernmental connections.

The roster of summer and wintering parties shows that a majority of the summer sojourners are scientists in disciplines such as biology, geology, and glaciology which require field work and cannot be profitably pursued during the months of winter darkness.

The wintering party runs heavily to those who can carry on observations during the winter in such disciplines as meteorology and upper atmosphere physics. Scientists from government agencies such as the Weather Bureau and Bureau of Standards dominate the winter roster, as they did during the IGY, but well over half the summer scientists now are affiliated with universities and other nongovernmental bodies.

Antarctica, surface and subsurface, remains the least known of continents, and Crary says that descriptive programs in the earth sciences and biology, particularly in geology and ecology, must be continued for some time to provide the framework for the basic research which is now beginning in earnest in Antarctica.

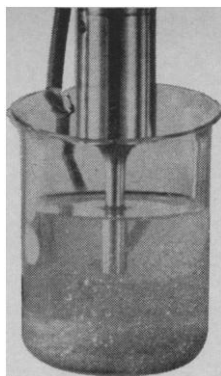
Little mapping was done during the IGY, but since then the United States and other nations have done a great deal to fill in the blanks on the map of Antarctica. In Western Antarctica, extensive mapping of mountains and coastal areas is being done, and new techniques of establishing ground controls to set distances accurately between known points are being used.

Seismologists not only find Antarctica a fine listening post for studying earthquake activity in the Southern Hemisphere but also are equipped to provide answers to questions on the thickness of the antarctic ice cap and what it conceals.

A breakdown of the \$7 million scientific budget for Antarctica shows that the atmospheric sciences continue to claim the largest single portion, some \$2.3 million, with \$965,000 of this earmarked for meteorology, \$700,000 for ionospheric studies, and lesser amounts for studies of the aurora, cosmic rays, and geomagnetism.

The earth sciences—geology, oceanography, glaciology—get the next-largest cut of the pie, about \$1.3 million; the life sciences, whose share is growing, get \$740,000 this year and cartography gets \$420,000.

About \$1 million is used for operation and upkeep of the *Eltanin*, and a \$200,000 item this year goes to set



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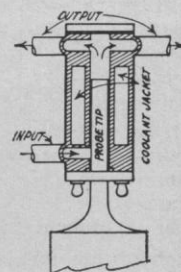
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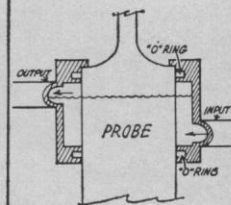


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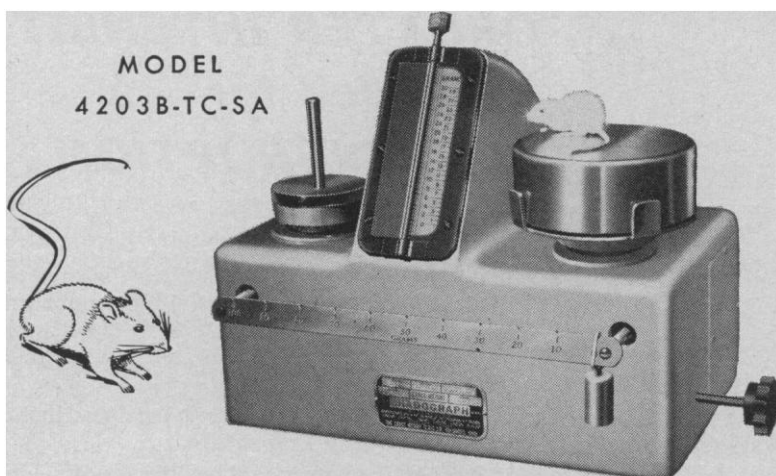


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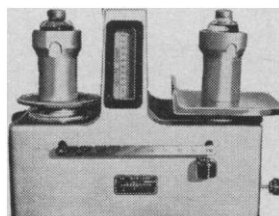
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up the new Eights station, named after James Eights, the first American scientist to visit the Antarctic (in 1830). The Eights station will be used largely for the study of upper-atmosphere physics and will be ready for operation during the International Quiet Sun Year, 1964-65.

Meteorology and upper-atmosphere physics have the longest history of concentrated work in Antarctica, and there is a feeling that efforts in these fields can slacken after the IQSY. The IGY and space programs have produced such a great quantity of data that all of them have by no means been analyzed, and in the Antarctic, too, data gathering has to some extent outrun analysis.

Comparatively little work has been done in Antarctica in the social and behavioral sciences. The effort of the environment on humans, particularly during the winter months, appears to offer broad scope to psychologists and sociologists, and program officials say they would welcome proposals for promising projects from first-class investigators.

The scientific climate in Antarctica appears favorable, in part because of the emphasis put on science in the Antarctic Treaty.

The Antarctic Treaty itself, in its limited, live-and-let-live way, has been working so smoothly that nobody talks about it much. This agreement, signed by the 12 nations which cooperated in the Antarctic IGY program, which include the United States and the Soviet Union, is essentially an extension of IGY agreements.

By signing the treaty the twelve nations indicated it was in their mutual interest that Antarctica should "be used exclusively for peaceful purposes" and that international cooperation in scientific investigation in Antarctica should continue.

Specifically prohibited in Antarctica are military operations and maneuvers of all kinds, establishment of military bases, and weapons testing. The treaty does not, however, bar the use of military personnel and equipment for scientific purposes.

Guarantees for the freedom of scientific investigation established during the IGY and provision for exchanges of information and persons are also written into the treaty.

The treaty also includes some interesting precedents in the field of arms control and disarmament. Article 5 prohibits any nuclear explosions or

disposal of radioactive wastes in Antarctica, and article 7 provides that all areas of Antarctica, including all stations and ships, shall be open to inspection at all times. Each signatory power may appoint its nationals as observers to carry out on-site inspections, and aerial observation is permitted as well.

The treaty is the first example of a limited nuclear arms and test ban and inspection agreement with both the United States and the Soviet Union as signatories. There have so far been no similar agreements for warmer latitudes, but the treaty itself and the history of international good fellowship in Antarctica are regarded as useful, if minor, political precedents.

The treaty tends to be vague on more mundane points of international law. For example, what happens when a national of one country commits a crime against a national of another; or, if someone strikes gold, who can claim it? The treaty says only that nationals remain under the jurisdiction of their own countries while on the continent of Antarctica. On territorial claims in the South Atlantic and Antarctica—where Argentina, Britain, and Chile particularly have been at odds—the treaty, in effect, puts such disputes in cold storage for 30 years by providing that while the treaty is in force no action shall diminish or enhance any claim of sovereignty in Antarctica.

Certainly the matter of territorial claims as well as the possibilities of exploiting the continent's ice-bound natural resources and the open question of the future military value of Antarctica figure in the mixed motives which keep the United States and other treaty powers there.

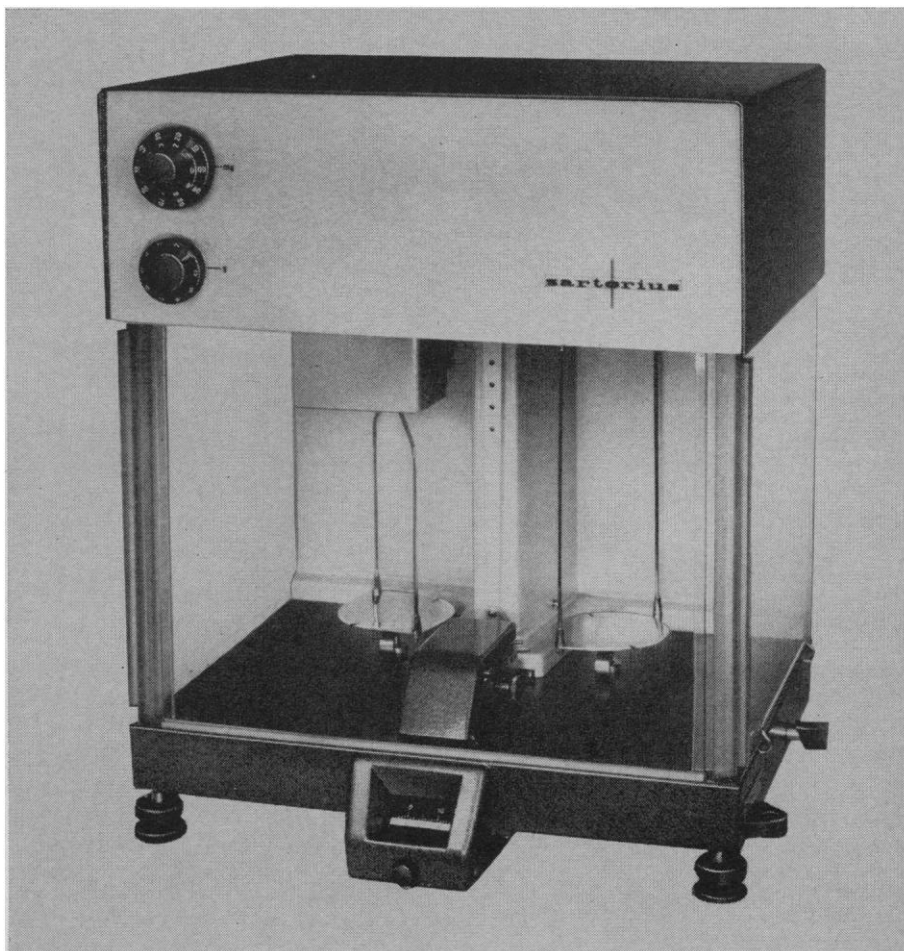
Were it not for these contingencies it is doubtful that Congress, mindful of vast expenditures for science on land, on sea, and in aerospace, would so willingly provide funds for antarctic operations which seem to be leveling off at about \$7 million for the science program and \$20 million for support costs annually.

With Antarctica colonized and somewhat civilized, the pattern of operation there seems set at least for the next decade. As if to mark the passing of an era, one of those Britishers who seem compelled to seek the more inaccessible and perilous parts of the world recently passed through NSF and remarked that the Antarctic no longer interested him and he thought he might have a try at the Blue Nile.

—JOHN WALSH

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